

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	§	
Ji U. Lee et al.	§	Group Art Unit: 1753
	§	
Serial No.: 10/671,143	§	Examiner: Rodney G. McDonald
	§	
Filed: September 25, 2003	§	Confirmation No.: 4553
	§	
For: SELF-ALIGNED GATED	§	Atty. Docket: 125695-1/YOD
CARBON NANOTUBE FIELD	§	GERD:0255
EMITTER STRUCTURES AND	§	
ASSOCIATED METHODS OF	§	
FABRICATION	§	

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December 10, 2007

/Patrick S. Yoder/

Date

Patrick S. Yoder

**REPLY BRIEF**

Dear Sir:

This is in response to the Examiner's Answer mailed on October 10, 2007.

As discussed in detail below, the Examiner improperly rejected pending claims 1-57 and 99, which are the subject of this Appeal. Accordingly, Appellants respectfully request full and favorable consideration by the Board, as Appellants strongly believe that claims 1-57 and 99 are currently in condition for allowance.

**A. First Ground of Rejection for Review on Appeal:**

The Examiner rejected claims 1-6, 9, 13-19, 22-27, 29, 31-38, 42-48, 51, 52, 54-56 and 99 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. No. 6,339,281 (hereinafter “Lee”) in view of the U.S. Patent Application Publication No. 2004/0067602 (hereinafter “Jin”).

Claims 1, 32 and 99 recite *methods for fabricating* carbon nanotube field emitter structure including growing at least one carbon nanotube from the catalyst in the presence of the plurality of electric field lines, where at least one carbon nanotube is grown in a direction substantially perpendicular to the surface of the substrate. The methods specifically require applying an *electrical potential* to the substrate and the conductor layer.

The electrical potential generates a plurality of electrical field lines that are deflected around the surface of the base layer structure. The plurality of electrical field lines have a strength that is greatest in a direction substantially perpendicular to the surface of the substrate. The application of the electrical potential in this fashion provides better control and alignment to the growth of the nanotubes.

**a. Even a combination of Lee and Jin fails to disclose the application of electrical potential between the substrate and the conductor layer**

The Examiner relied upon Lee as teaching a method of fabricating a triode carbon nanotube field emitter array. The Examiner relied upon Jin as teaching utilizing an

electrical potential to cause a field to form at the substrate such that the carbon nanotubes grow in a direction perpendicular to the surface of the substrate. The Examiner cited passages at paragraphs 14 and 50 from Jin in support of the arguments. The passages cited at paragraph 50 reads:

The fifth step is to grow the nanowires from each nano island catalyst position. Advantageously the growth is effected by the chemical vapor deposition (CVD) process. The vertical alignment of the nanowire during growth can be enhanced by an electrical field globally applied along the vertical direction (perpendicular to the substrate) or by an intrinsically present electric field, as is used in microwave plasma CVD growth (see Bower et al.). FIG. 2(d) shows the gate structure with individual nanowires 26 vertically grown from nano islands near the center of the gated emission apertures 25. (Emphasis added.)

The cited passage from Jin and the indeed entire reference do not support the Examiner's position, however. The passage cited by the Examiner from Jin, at paragraph 50, teaches applying an electric field globally or intrinsically. Clearly, the globally applied electrical field cannot be considered equivalent to the application of electrical potential between the substrate and the conductor layer. Mere presence of the electrical field for the growth of the carbon nanotubes is not the point of discussion. The way the electrical field is generated is where the emphasis lies. It is believed that significantly different results can be achieved by the invention as opposed to the "global" field application technique of Jin. Such results could not be reasonably foreseen but for the invention. The cited reference does not teach or even suggest using the substrate and the conductor layer to apply the electrical potential to the arrangement during the growth of the nanotubes.

Even if Lee and Jin could be combined, the combination would not logically teach a person skilled in the art to apply the electric potential to the substrate. On the contrary, the combination would more readily teach placing the *entire structure* of Lee in the CVD

chamber of Jin, subjected to an external electric field, or to the electric field present inside the CVD chamber. There is no motivation for, and the references do not teach, creating a field *within the device itself* by applying an electrical potential to its own layers.

**B. Second Ground of Rejection for Review on Appeal:**

The Examiner rejected claims 5-6 and 22-23 as rejected under 35 U.S.C. §103(a) as being unpatentable over Lee in view of Jin, and further in view of RE38,561.

In response to rejection of claims depending from claim 1, it is respectfully submitted that the secondary references do not obviate the deficiencies of Lee and Jin discussed above. Accordingly, inasmuch as independent claim 1 is allowable, claims depending therefrom are allowed at least by virtue of their dependency from allowable base claims.

**C. Third Ground of Rejection for Review on Appeal:**

The Examiner rejected claim 8 under 35 U.S.C. §103(a) as being obvious over Lee in view of Jin, and further in view of Takemura.

In response to rejection of claims depending from claim 1, it is respectfully submitted that the secondary references do not obviate the deficiencies of Lee and Jin discussed above. Accordingly, inasmuch as independent claim 1 is allowable, claims depending therefrom are allowed at least by virtue of their dependency from allowable base claims.

**D. Fourth Ground of Rejection:**

The Examiner rejected claims 20, 21, 49 and 50 under 35 U.S.C. §103(a) as being unpatentable over Lee in view of Jin, and further in view of Zhang.

In response to rejection of claims depending from claims 1 and 32, it is respectfully submitted that, here again, the secondary references do not obviate the deficiencies of Lee and Jin discussed above. Accordingly, inasmuch as independent claims 1 and 32 are allowable, claims depending therefrom are allowed at least by virtue of their dependency from allowable base claims.

**E. Fifth Ground of Rejection:**

The Examiner rejected claims 28 and 57 under 35 U.S.C. §103(a) as being unpatentable over Lee in view of Jin, and further in view of Bower.

In response to rejection of claims depending from claims 1 and 32, it is respectfully submitted that the secondary references do not obviate the deficiencies of Lee and Jin discussed above. Accordingly, inasmuch as independent claims 1 and 32 are allowable, claims depending therefrom are allowed at least by virtue of their dependency from allowable base claims.

**Conclusion**

Appellants respectfully submit that all pending claims are in condition for allowance and urge the Board to reverse the outstanding rejections.

Respectfully submitted,

Date: December 10, 2007

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